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QUALITY ASSURANCE BRANCH

JAN 12 1985

ERT Project No. D470  
 ERT Ref. No. 101-WGW-074

ENVIRONMENTAL SERVICES DIVISION

January 10, 1986

Mr. Babu Paruchuri  
 U.S. Environmental Protection Agency  
 Environmental Services Division  
 Quality Assurance Office  
 536 South Clark Street  
 Chicago, IL 60605

Dear Mr. Paruchuri:

Shown on Table 1 are the results for response factors at three concentrations for the compounds on the second half of Table 1 of the method to be used for part per trillion analyses. The percent relative standard deviation over the range of concentrations is acceptable for the concentration level involved. This work was performed using a single internal standard. We have demonstrated with the other PAH compounds that use of multiple internal standards greatly improves the precision of the calibration curve. Therefore, when this method is used at SLP, as described in the current revision of the analytical procedures, the precision will be even better than demonstrated in Table 1. Multiple internal standards will also eliminate the low response factors obtained for the heavier PAH. Each PAH/heterocycle will be calculated relative to an internal standard of similar molecular weight.

Extracts of each four liter water samples are concentrated to 0.5 ml final volume, giving an actual sample volume of 8 liters. Background noise typically averages 500 area counts. Assuming three times the background and 40 Ng/ml internal standard giving 100,000 area counts, the equation would be:

$$\text{Conc., ppt} = \frac{(1500) (40)}{(100,000) (\text{R.F.})}$$

Assuming the lowest response factor of 0.036, the minimum detectable concentration would be 16.7 Ng/ml or 2.1 ppt. For the other compounds, a detection limit of 2 ppt is clearly easily obtainable.

When the work is performed at SLP, an initial five-point calibration curve will be obtained using the multiple internal standards as described in the method. This will demonstrate, for that work, an acceptable precision and

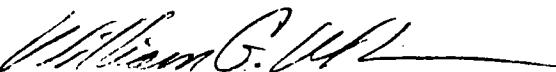
Mr. Babu Paruchuri  
Page Two  
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instrument detection limit. In addition, concurrent with the extraction and analysis of samples, ERT will analyze eight (8) replicates of a QC mixture of the compounds shown on Table 1 of this letter, at 5 ppt. This will allow ERT to present precision and accuracy data for the method, as well as determine the method detection limit (MDL) for the method as written. Therefore despite any historical data and the change in the analytical method, the work performed at SLP will have sufficient QA/QC data to present the same complete and defensible analytical data package for this list of PAH/heterocycles as is demonstrated in the QC package for the other PAH, which you received earlier.

I have not included precision and accuracy data for the PAH/heterocycle list of compounds, for two reasons. First the issue is moot if we perform sufficient QC during analysis of the samples to demonstrate acceptable precision and accuracy and a sufficiently low MDL. Second, because of the changes in the analytical method any precision and accuracy data presented would have no meaning relative to the method to be used. ERT has demonstrated that the analytical method works. The PAH precision and accuracy data clearly establishes that ppt levels of PAH can be measured in water. The data presented in Table 1 of this letter demonstrates the ability to achieve sufficient instrumental sensitivity using GC/MS/SIM. The compounds in question are very similar to the PAH compounds already verified. There is no question that the method works for the PAH/heterocycles list of compounds also. Therefore, the only issue remaining is to demonstrate the actual precision and accuracy values for this version of the method. This is most appropriately done by performing the necessary QA/QC analyses in the same manner as the samples. In the interest of preventing continued delay, ERT proposes to perform the necessary QA/QC analyses immediately preceding the analysis of the SLP samples and presenting the entire data package as part of the data report. In this way EPA takes no risk since the SLP data will only be acceptable if the appropriate QA/QC data is successfully demonstrated. There are no further time delays because ERT will begin the QA/QC analyses concurrent with the approval and implementation of the GAC study, completing the SLP analyses and the QA/QC analyses together.

I will be out of the country from January 15 through January 22, 1986. Therefore please review this material promptly upon receipt so we may resolve any remaining issues prior to or on Tuesday, January 14, 1986. John Craun or I will contact you on Monday, January 13, 1986.

Very truly yours,



William Gary Wilson  
Division Manager  
Analytical Chemistry Services

WGW/r

cc: J. Craun - RT&CC  
D. Bicknell - EPA  
A. Broughton - ERT

TABLE 1  
RESPONSE FACTORS AT NOMINAL CONCENTRATION  
Ng/ml

<u>Compound</u>	<u>25</u>	<u>100</u>	<u>150</u>	<u>Mean</u>	<u>Std.</u> <u>Dev.</u>	<u>%</u> <u>RSD</u>
Indene	0.312	0.330	0.355	0.332	0.018	5
Indole/2,3-dihydroindene	0.213	0.122	0.113	0.149	0.045	30
2,3-Benzofuran	0.379	0.404	0.163	0.315	0.108	34
Quinoline	0.105	0.0684	0.172	0.115	0.043	37
Benza(b)thiophene	0.309	0.205	0.343	0.286	0.059	20
2-methyl naphthalene	0.247	0.224	0.235	0.235	0.009	4
1-methyl naphthalene	0.100	0.0921	0.158	0.117	0.029	25
Biphenyl	0.314	0.298	0.335	0.316	0.015	5
Carbazole	0.146	0.139	0.0600	0.115	0.039	34
Acridine	0.0526	0.0693	0.0930	0.072	0.017	23
Dibenzothiophene	0.146	0.189	0.111	0.149	0.032	21
Perylene	0.0420	0.040	0.0270	0.036	0.007	18

**TYPICAL RECONSTRUCTED ION CHROMATOGRAPH (RIC)  
AND  
SELECTED MASS CHROMATOGRAMS**

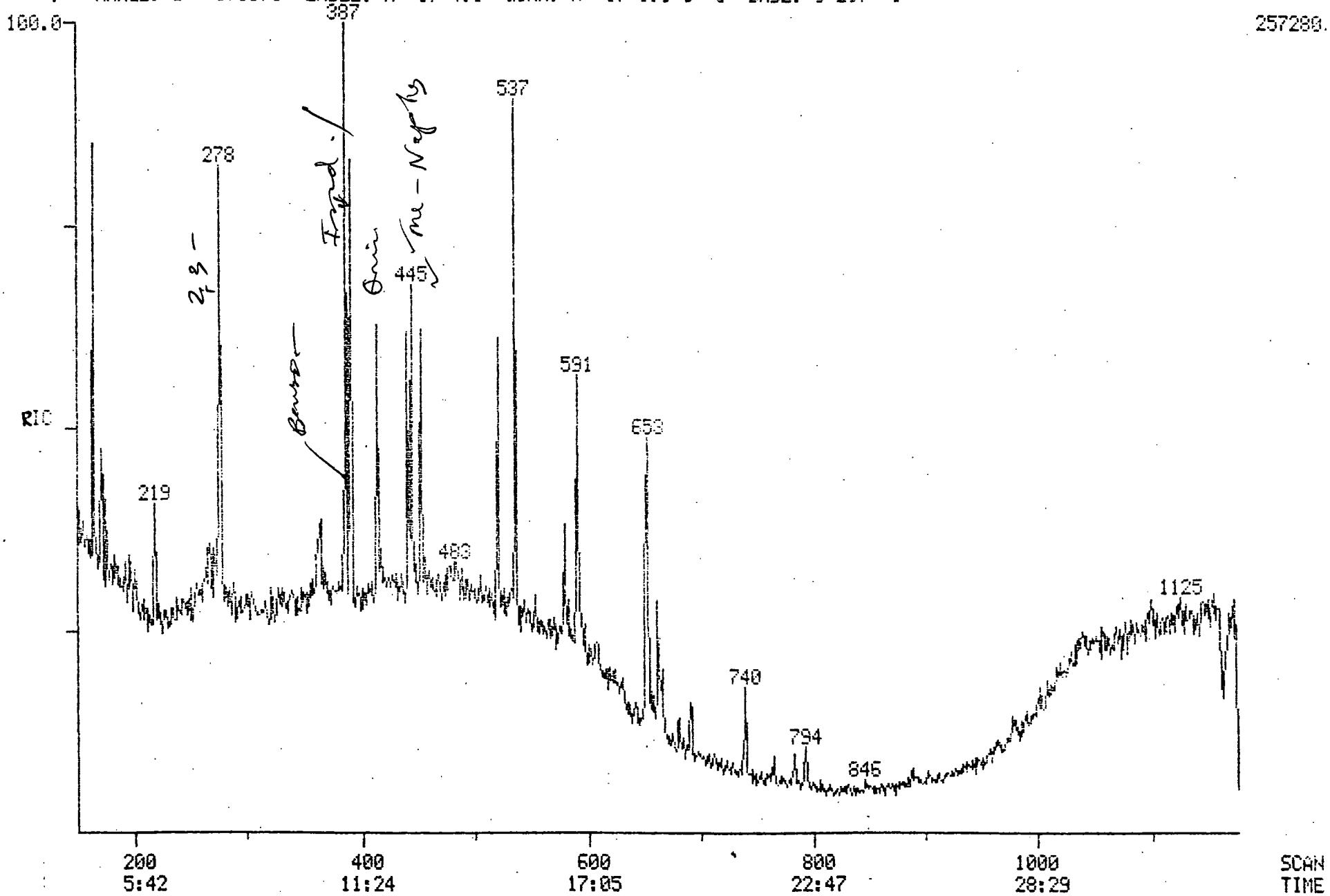
MIDRIC  
10/05/85 14:07:00

DATA: BNRPAH14 #1  
CALI: BNRPAH14 #2

SCANS 150 TO 1175

SAMPLE: TRW + BHRR PAR. BRA  
COND.: METHOD EX

RANGE: G 1.1175 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



MIDRIC+MASS CHROMATOGRAM  
10/05/85 14:07:00

DATA: BNRPAH14 #1 SCANS 225 TO 325  
CALI: BNRPAH14 #2

SAMPLE: TRW + BNRR PAR, BRA  
COND.: METHOD EX

RANGE: G 1,1175 LABEL: H 1, 4.0 QUAN: A 1, 1.0 J 0 BASE: U 20, 3

278

135936.

276432.

135936.

2,3-BENZOFURAN

91 NG/ML

118.035

± 0.500

232

2831.

5452.

242

3884.

26098.

255

4016.

12968.

269

4129.

30480.

286

4208.

21600.

300

3528.

10420.

317

1615.

2296.

279

144837.

382751.

145152.

RIC

239

8230.

23616.

256

11568.

60582.

268

24019.

150483.

289

11600.

23279.

305

9344.

42240.

240  
6:50

260  
7:24

280  
7:59

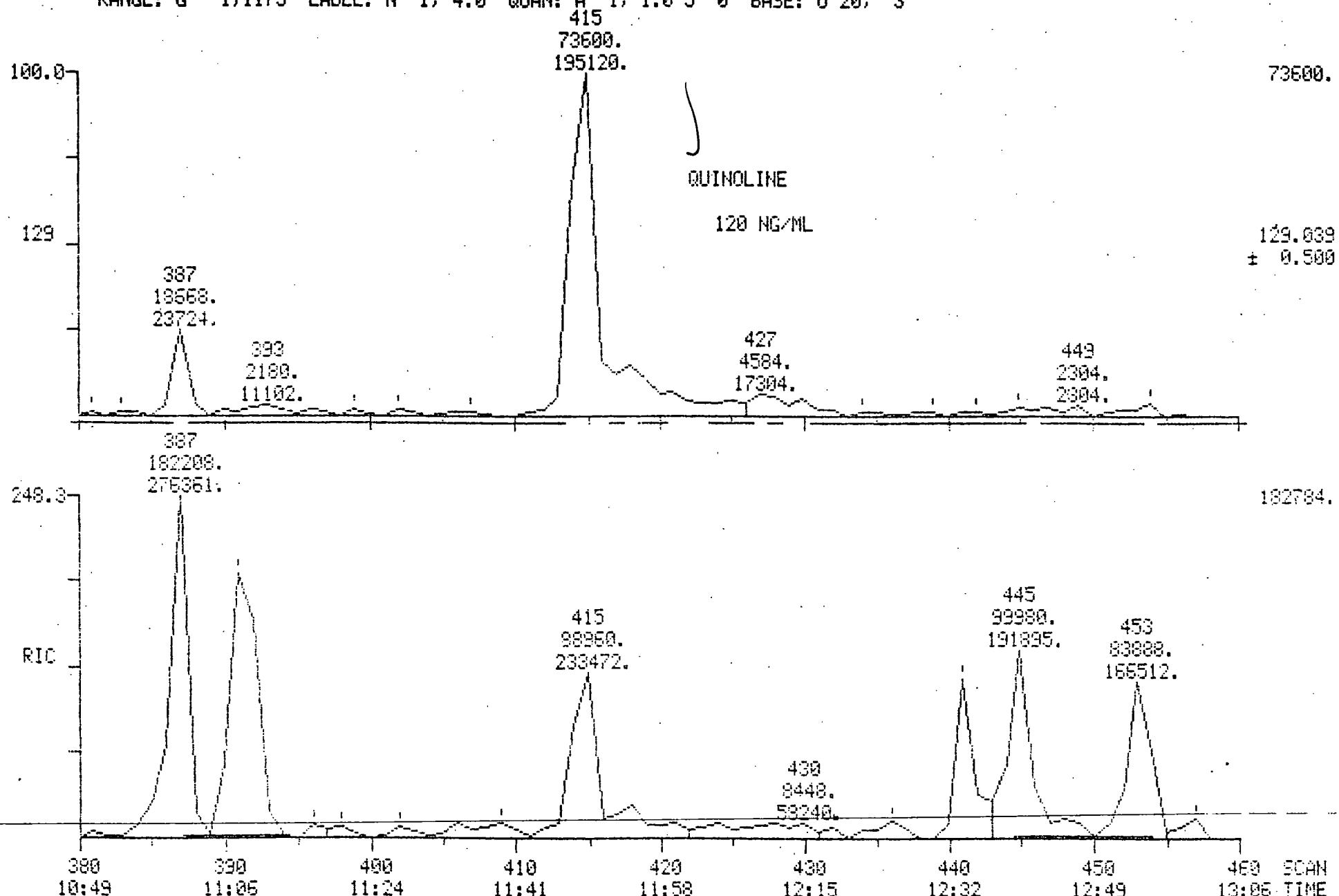
300  
8:33

320  
9:07

SCAN  
TIME

MIDRIC+MASS CHROMATOGRAM  
10/05/85 14:07:00  
SAMPLE: TRW + BNRR PAR, BRA  
COND.: METHOD EX  
RANGE: G 1,1175 LABEL: N 1, 4.0 QUAN: A 1, 1.0 J 0 BASE: U 20, 3

DATA: BNRPAH14 #1 SCANS 380 TO 460  
CALI: BNRPAH14 #2



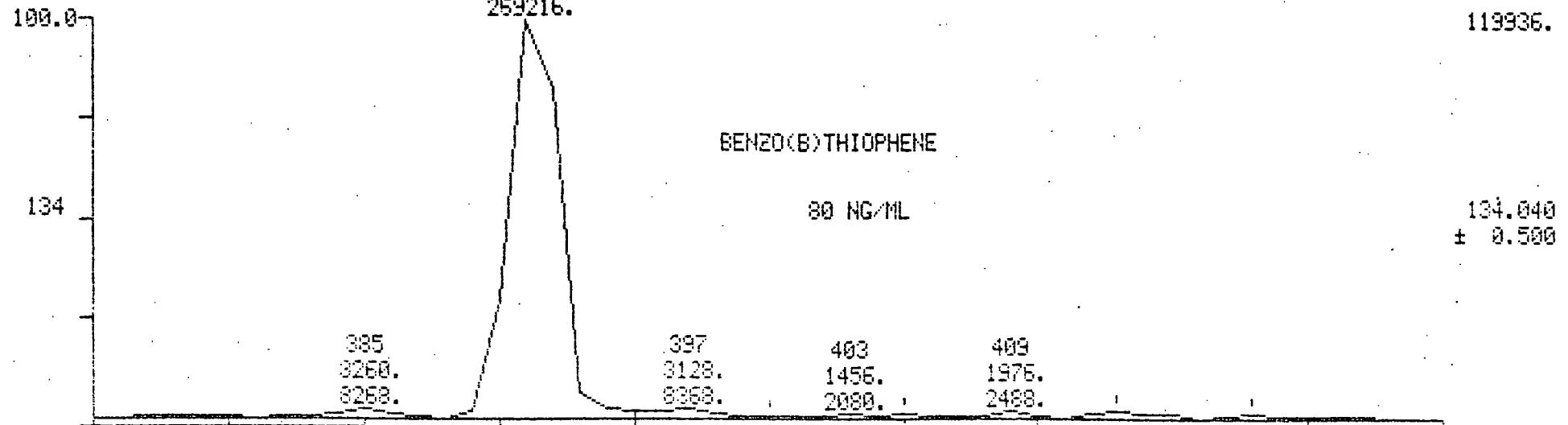
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10/05/85 14:07:00  
SAMPLE: TRW + BNRR PAR, BRA  
COND.: METHOD EX

DATA: BNRPAH14 #1  
CALI: BNRPAH14 #2  
SCANS 375 TO 425

RANGE: G 1,1175 LABEL: N 1, 4.0 QUAN: A 1, 1.0 J 0 BASE: U 20, 3

391  
119936.  
259216.

119936.



MIDRIC+MASS CHROMATOGRAM

10/05/85 14:07:00

SAMPLE: TRW + BNRR PAR, BRA

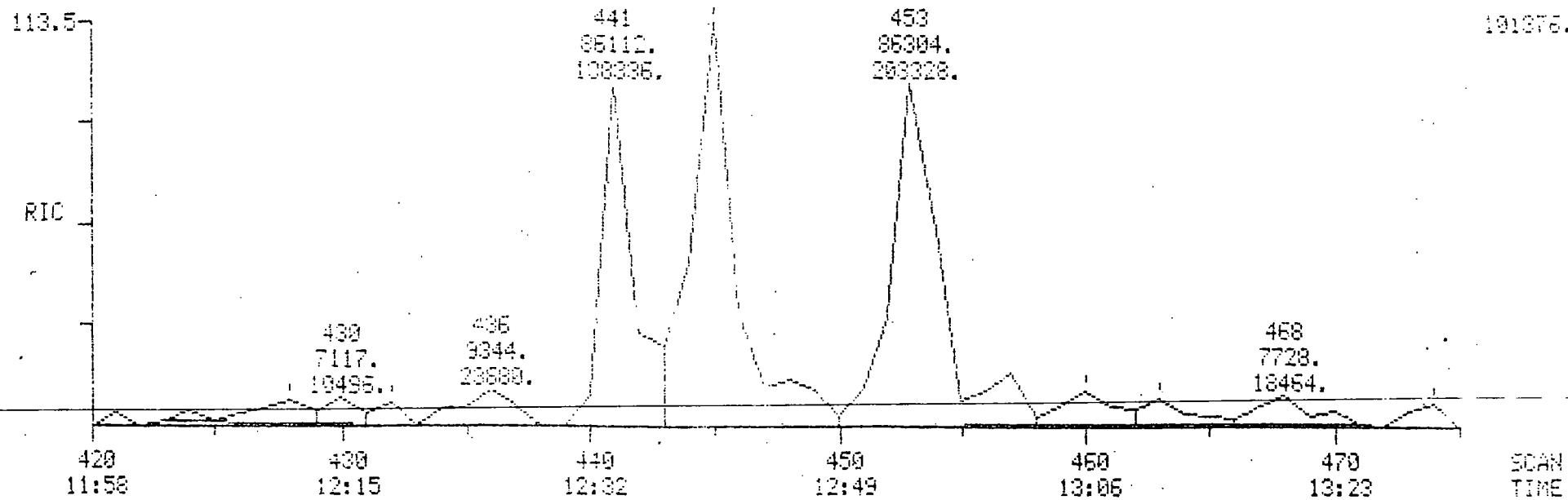
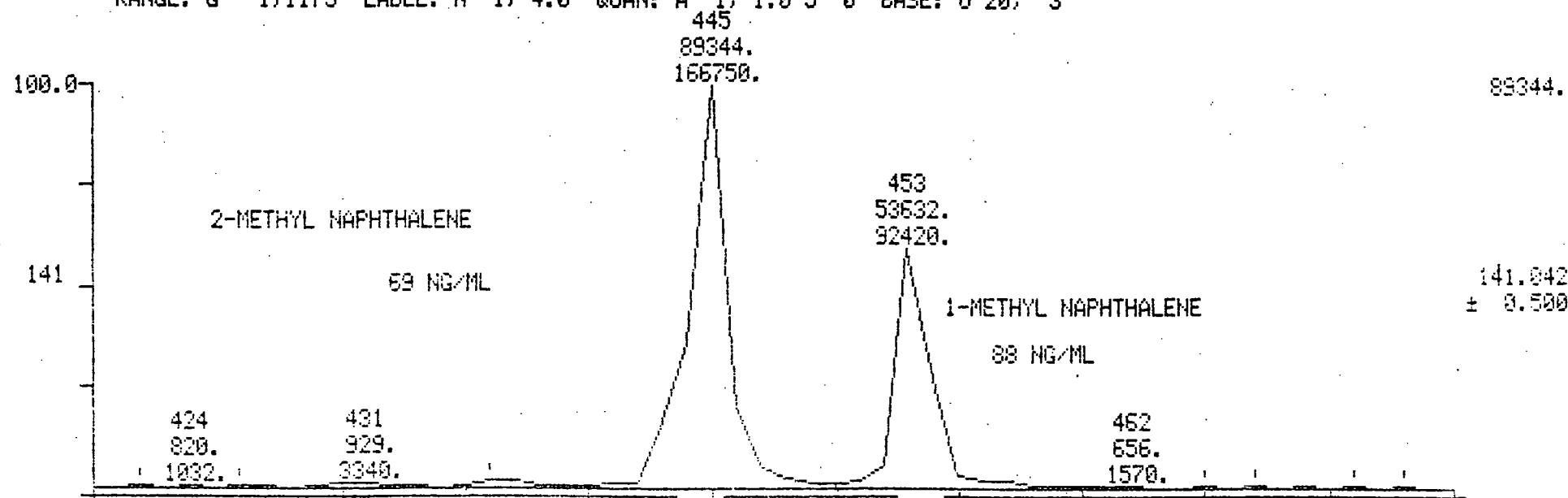
COND.: METHOD EX

RANGE: G 1.1175 LABEL: N 1, 4.0 QUAN: A 1, 1.0 J 0 BASE: U 20, 3

DATA: BNRPAH14 #1

CALI: BNRPAH14 #2

SCANS 420 TO 475



MIDRIC+MASS CHROMATOGRAM

10/05/85 14:07:00

SAMPLE: TRW + BNRR PAR, BRA

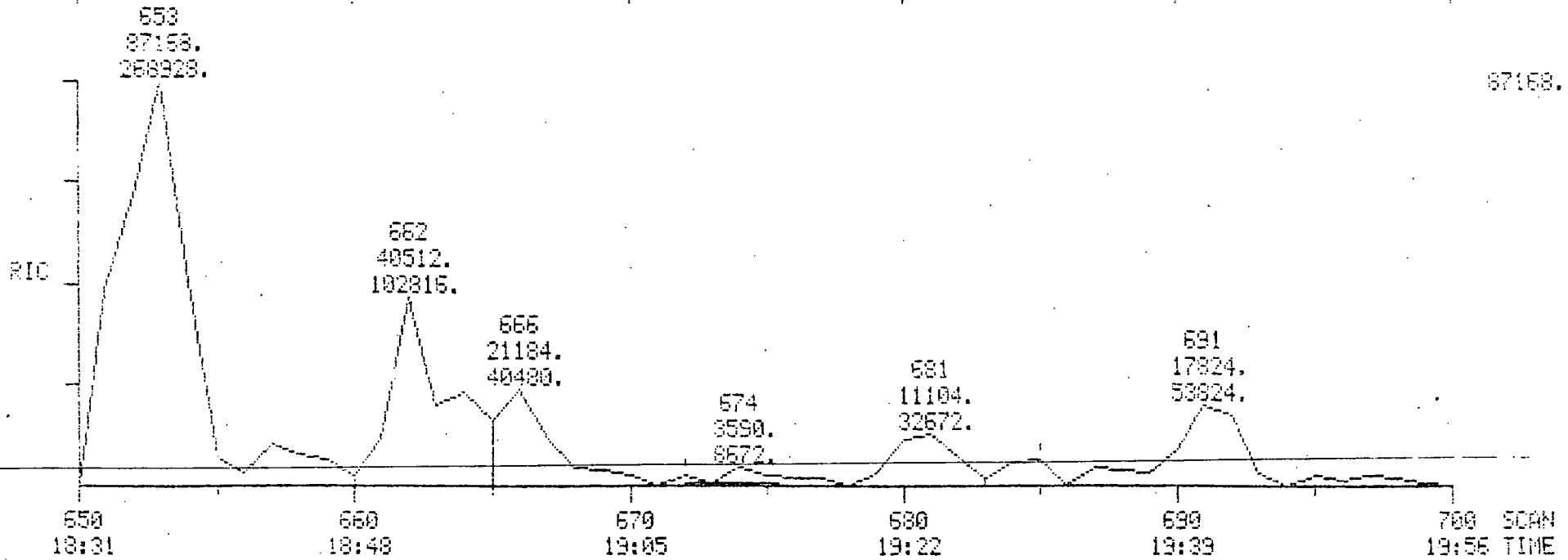
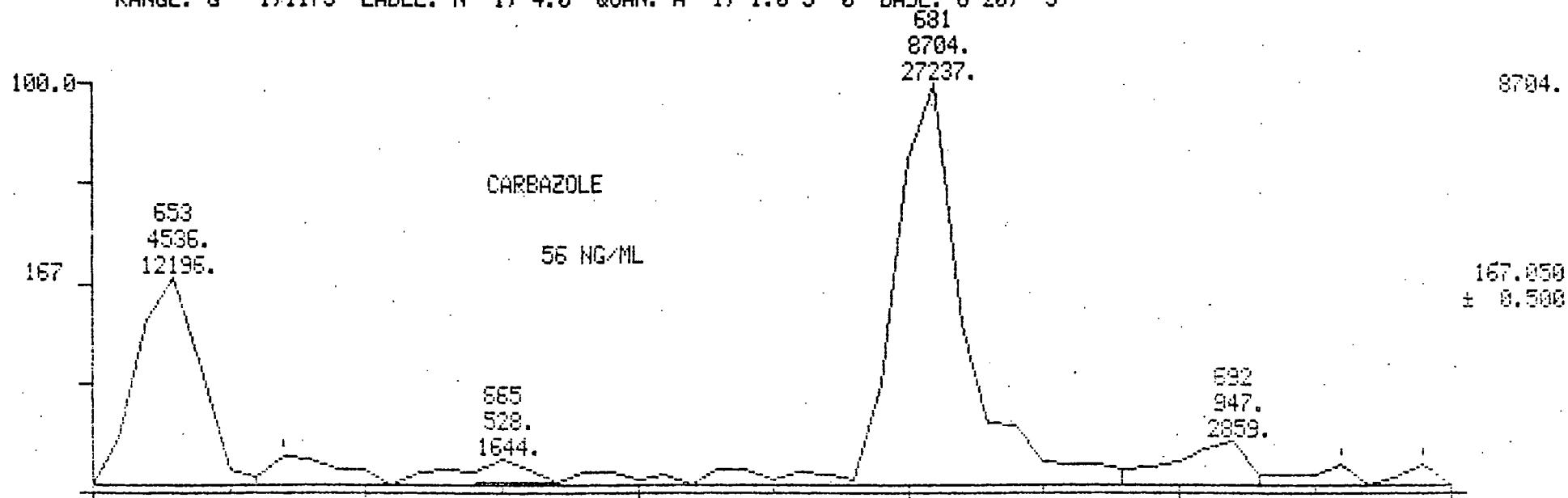
COND.: METHOD EX

RANGE: G 1,1175 LABEL: N 1, 4.0 QUAN: A 1, 1.0 J 0 BASE: U 20, 3

DATA: BNRPAH14 #1

CALI: BNRPAH14 #2

SCANS 650 TO 700



MIDRIC+MASS CHROMATOGRAM  
10/05/85 14:07:00  
SAMPLE: TRW + BNRR PAR, BRA  
COND.: METHOD EX  
RANGE: G 1,1175 LABEL: N 1, 4.0 QUAN: A 1, 1.0 J 0 BASE: U 20, 3

DATA: BNRPAH14 #1 SCANS 600 TO 700  
CALI: BNRPAH14 #2

